contain a large number of Chinese novelties. One part of the last volume is devoted to the Stapeliæ of South Africa. The seventeenth volume is wholly devoted to new ferns; and the first volume of what it is intended to call the fourth series will consist entirely of orchids. Three parts of this have already appeared.

ON VAN DER WAALS'S TREATMENT OF LAPLACE'S PRESSURE IN THE VIRIAL EQUATION: A LETTER TO PROF. TAIT.

MY DEAR PROF. TAIT,—In Part IV. of your "Foundations of the Kinetic Theory of Gases,"[1] you take exception to the manner in which Van der Waals has introduced Laplace's intrinsic pressure K into the equation of virial. "I do not profess to be able fully to comprehend the arguments by which Van der Waals attempts to justify the mode in which he obtains the above equation. Their nature is somewhat as follows:—He repeats a good deal of Laplace's capillary work, in which the existence of a large, but unknown, internal molecular pressure is established, entirely from a statical point of view. He then gives reasons (which seem, on the whole, satisfactory from this point of view) for assuming that the magnitude of this force is as the square of the density of the aggregate of particles considered. But his justification of the introduction of the term a/v^2 into an account already closed, as it were, escapes me. He seems to treat the surface-skin of the group of particles as if it were an additional bounding-surface, exerting an additional and enormous pressure on the contents. Even were this justifiable, nothing could justify the multiplying of this term by $(v - \beta)$ instead of by v alone. But the whole procedure is erroneous. If one begins with the virial equation, one must keep strictly to the assumptions made in obtaining it, and consequently *everything* connected with molecular force, whether of attraction or of elastic resistance, must be extracted from the term $\Sigma(\mathrm{R}r)$."

With the last sentence all will agree; but it seemed to me when I first read Van der Waals's essay that his treatment of Laplace's pressure was satisfactory, and on reperusal it still appears to me to conform to the requirements above laid down. As the point is of importance, it may be well to examine it somewhat closely. The question is as to the effect in the virial equation of a mutual attraction between the parts of the fluid, whose range is small compared with the dimensions of bodies, but large in comparison with molecular distances.

The problem thus presented may be attacked in two ways. The first, to which I will recur, is that followed by Van der Waals; but the second is more immediately connected with that form of the equation which you had in view in the passage above quoted.

In the notation of Van der Waals (equation 8)

$$\tfrac{1}{2}\Sigma m\mathrm{V}^2 = \tfrac{1}{2}\Sigma f\rho - \tfrac{1}{2}\Sigma \mathrm{R}r\cos(\mathrm{R}, r),$$

where V denotes the velocity of a particle m, which is situated at a distance r from the origin, and is acted upon by a force R, while (R, r) denotes the angle between the directions of R and r. The intermediate term is to be omitted if R be the total force acting upon m. It represents the effect of such forces, f, as act mutually between two particles at distances from one another equal to ρ. In the summation the force between two particles is to be reckoned once only, and the forces accounted for in the second term are, of course, to be excluded in the third term.

In the present application we will suppose all the mutual forces accounted for in the second term, and that the only external forces operative are due to the pressure of the containing vessel. No one disputes that the effect of the external pressure is given by

$$-\tfrac{1}{2}\Sigma \mathrm{R}r\cos(\mathrm{R}, r) = \tfrac{3}{2}pv;$$

so that

$$\tfrac{1}{2}\Sigma m\mathrm{V}^2 = \tfrac{3}{2}pv + \tfrac{1}{2}\Sigma\rho\phi(\rho),$$

if with Laplace we represent by $\phi(\rho)$ the force between two particles at distance ρ. The last term is now easily reckoned upon Laplace's principles. For one particle in the interior we have

$$\tfrac{1}{2}\cdot 4\pi\int_0^\infty \phi(\rho)\rho^3 d\rho,$$

and this, as Laplace showed,[1] is equal to 3K. The second summation over the volume gives $3\mathrm{K}v$, but this must be halved. Otherwise each force would be reckoned twice. Hence

$$\begin{aligned}\tfrac{1}{2}\Sigma m\mathrm{V}^2 &= \tfrac{3}{2}pv + \tfrac{3}{2}\mathrm{K}v \\ &= \tfrac{3}{2}v(p + \mathrm{K}),\end{aligned}$$

showing that the effect of such forces as Laplace supposed to operate is represented by the addition to p, the pressure exerted by the walls of the vessel, of the intrinsic pressure K. In the above process the particles situated near the surface are legitimately neglected in comparison with those in the interior.

Van der Waals's own process starts from the original form of the virial equation—

$$\tfrac{1}{2}\Sigma m\mathrm{V}^2 = -\tfrac{1}{2}\Sigma \mathrm{R}r\cos(\mathrm{R}, r),$$

where R now refers to the *whole* force operative upon any particle; and it appears to me equally legitimate. For all particles in the interior of the fluid R vanishes in virtue of the symmetry, so that the reckoning is limited to a surface stratum whose thickness is equal to the range of the forces. Upon this stratum act normally both the pressure of the vessel and the attraction of the interior fluid. The integrated effect of the latter throughout the stratum is equal to the intrinsic pressure, and, on account of the thinness of the stratum, it enters into the equations in precisely the same way as the external pressure exerted by the vessel. The effect of Laplace's forces is thus represented by adding K to p, in accordance with the assertion of Van der Waals.

I am in hopes that, upon reconsideration, you will be able to admit that this conclusion is correct. Otherwise, I shall wish to hear more fully the nature of your objection, as the matter is of such importance that it ought not longer to remain in doubt.

Believe me yours very truly,

RAYLEIGH.

L'Abbaye de St. Jacut-de-la-Mer, September 7.

NOTES.

THE French Association for the Advancement of Science met at Marseilles on September 17, under the presidency of M. P. P. Dehérain, who chose as the subject of his address the part played by chemistry and physiology in agriculture. The meeting comes to an end to-day. There were general excursions on Sunday to Arles, and on Tuesday to Aix; and it is proposed that to-morrow, the 25th, there shall be a final excursion to the Mediterranean coast.

THE Congress of German Naturalists and Physicians was opened at Halle on Monday by Prof. His, of Leipzig. The meeting was attended by 1215 persons, including many distinguished foreign physicians and men of science and 280 ladies.

THE Helmholtz celebration, deferred from August 31, is now fixed for November 2. After the ceremony the delegates and others will dine together at the Hotel Kaiserhof.

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[1] Ed. Trans., vol. xxxvi., Part 2, p. 261.

[1] See also *Phil. Mag.*, October 1890, p. 292.

By the death of August von Pelzeln, which took place on the 2nd inst. at Ober-Döbling, near Vienna, Europe has lost one of her foremost ornithologists. He had been in failing health for some years, and had recently retired, after forty years' service, from his post of Custos of the Imperial Museum at Vienna, where he had charge of the collections of Mammalia and birds. Von Pelzeln will be always celebrated in the memory of zoologists by his important essays on the collections in the Vienna Museum, but his most enduring work will be found in the famous "Ornithologie Brasiliens," wherein he gave a detailed account of the collections made by the great traveller Natterer in the early part of the present century. Only last year he published in the *Annalen des k.k. naturhistorischen Hofmuseums*, an account of the formation of the collections of Mammalia and birds in the Imperial Cabinet, which is a very valuable historical record. The amiability of his character and his great knowledge of zoology had raised up for Von Pelzeln a host of friends in every country, and the news of his death will be received with wide-spread regret.

A Reuter telegram from New York announces the death of Prof. William Ferrel, the meteorologist.

The Royal Academy of Sciences at Lisbon send official notice of the decease of their Secretary, José Maria Latino Coelho, who died on the 29th ult. at Cintra, at the age of sixty-six. Besides his Secretaryship of the Académie Royale des Sciences, Prof. Coelho held the post of Director of the Mineralogical Section of the Museum at the École Polytechnique de Lisbonne.

The death of M. Wilken, the well-known Dutch ethnologist, has excited much regret in Holland, where his scientific work was greatly appreciated. He was forty-four years of age, and had spent some time as a Government official in the Dutch East Indies, where he had ample opportunities for carrying on his favourite studies.

Prof. K. Goebel has been appointed Professor of Botany in the University, and Director of the Botanic Garden at Munich, in the place of the late Carl v. Nägeli.

The Photographic Society of Great Britain announce the holding of an exhibition, which will be open from September 28 to November 12.

The most interesting part of the Royal Horticultural Society's exhibition on Tuesday was a series of the so-called carnivorous and insect-eating plants. It was hoped that the display of this series would tend to correct some very mistaken ideas which are said to be current on the subject. According to Mr. Weathers, the Assistant Secretary of the Royal Horticultural Society, some persons, relying on what they have heard, will assert that "these plants can easily dispose of a beefsteak or mutton chop if their digestive organs are in thorough repair."

The annual meeting of the Federated Institution of Mining Engineers was held on Tuesday at the Mason College, Birmingham, and was attended by about 120 members. Mr. T. W. Embleton, of Leeds, presided. In the report it was stated that the Council had not yet undertaken any special inquiry connected with the objects of the Institution, but their attention had been directed to the question of safe explosives for use in mines, the mechanical ventilation of mines, and other subjects. By the permission of the Durham Coal-owners' Association and the Durham Miners' Association, a report upon the fumes produced in mines by roburite, tonite, and gunpowder had been printed in the Transactions. The North of England Institution had appointed a committee to examine and report upon the so-called "flameless" explosives for use in mines. A paper sketching the geology of the Birmingham district was read by Prof. Lapworth. A paper was also submitted by Messrs. W. F. Clark and H. W. Hughes, in which the local method of working the thick coal was described to the visitors, and the peculiarities of the South Staffordshire coal-fields were described in technical detail. Mr. Arthur Sopwith supplied some similar information with reference to the North Staffordshire portion of the coal-field. These two papers were taken as read, and the discussion was deferred until the members of the Institution had visited the principal Staffordshire pits.

A Report for the year ending May 31 last, by Mr. G. J. Swanston, the Assistant Secretary of the Marine Department of the Board of Trade, upon the colour tests used in the examination of candidates for masters' and mates' certificates in the British mercantile marine has been issued as a Parliamentary paper. The number of persons who presented themselves for examination for masters' and mates' certificates of competency under Form "Examination 2" amounted to 4688, being an increase of 26 over the previous year, when 4662 were examined. In the past year 31 persons were rejected for their inability to distinguish colours, as compared with 23 rejected in the previous year. The number of persons examined in colours only under Form "Examination 2*a*" amounted to 601. Of these, 32 were rejected, being an increase of over 1·8 per cent. as compared with the previous year, when, out of 839 candidates examined, 29 were rejected. A few of those who failed to pass succeeded afterwards in satisfying the examiners. One man, who, on March 3, described a green card as drab, drab as green, pink glass as salmon and green, standard green as blue, bottle green as red, and neutral as green, passed a fortnight later, having apparently learned to distinguish the colours in the intervening period. The mode of conducting the colour-test examination described in the Report for the year 1887 is still in operation; but Mr. Swanston notes the fact that the whole subject of colour-vision and the best mode of conducting the examinations are now being investigated by a Committee appointed by the Royal Society.

On his return from Japan, sixteen years ago, Prof. Rein, the well-known authority on Japanese art and industry, planted in the Botanical Garden at Frankfort some specimens of the lacquer-tree (*Rhus vernicifera*), from which the Japanese obtain the juice employed in the production of their famous lacquer work. According to the *Times*, there are now at Frankfort thirty-four healthy specimens of the lacquer-tree, 30 feet high and 2 feet in girth a yard from the ground; and the young trees, which have sprung from the original tree's seed, are in a flourishing condition. It seems to be proved, therefore, that the lacquer-tree is capable of being cultivated in Europe, and it only remains to be seen whether the juice is affected by the changed conditions. The *Times* says that, to ascertain this, Prof. Rein has tapped the Frankfort trees, and has sent some of the juice to Japan, where it will be used by Japanese artists in lacquer work, who will report on its fitness for lacquering. In the meantime, some of the most eminent German chemists are analyzing samples of the juice taken from the trees at Frankfort, and samples of the juice sent from Japan; and should their reports and the reports from Japan be favourable, it is probable that the tree will be largely planted in public parks and other places in Germany. In course of time a skilled worker in lacquer would be brought over from Japan to teach a selected number of workmen the art of lacquering wood, and in this way it is hoped that a new art and craft may be introduced into Europe. Prof. Rein has been conferring with the authorities at Kew as to the results of his experiment.

The Hydrographic Department of the Admiralty has just published full details of the determinations of the latitudes and longitudes of six stations on the west coast of Africa—namely, Port Nolloth, Mossamedes, Benguela, St. Paul de Loanda, São Thome, and Bonny. The observations were made in 1889 by Commander T. F. Pullen, R.N., and Mr. W. H. Finlay, under the direction of Dr. Gill, of the Cape Observatory. Whilst stationed at Bonny, Commander Pullen succumbed to malarial fever, and Dr. Gill has since taken charge of the reductions. The observations would not have been possible but for the courtesy of the officials of the Eastern and South African Telegraph Company, who placed their cables at the disposal of the observers.

Neptunia for July gives a description of the frigate *Scilla*, set apart by the Italian Government for the hydrographic exploration of the Mediterranean, and of its scientific fittings and instruments. By the end of September the *Scilla* was expected to be at work along the Italian possessions in the Red Sea, investigating the fauna and flora, and the temperature at different depths.

DR. A. ALCOCK, the Surgeon-Naturalist of the Marine Survey of India, is able to give a most favourable report of the work done in natural history on board the *Investigator* during the year ending March 1, 1891. The deep-sea researches made great progress. Not only has the work of collection been much more successful since the use of the reversible trawl and wire-rope, but the collections themselves are becoming better arranged; so that should it ever be decided to report upon them, group for group, in systematic detail, there will be abundance of material all sorted ready to the hand. Dr. Alcock is most anxious that such a report should at some time be undertaken; for apart from the Marine Survey of India nothing whatever, he thinks, is likely to be made known of the life of the depths of the Indian Seas, and of the physical and chemical characters of the deposits now being laid down on the bottom of those seas. Further, there are good reasons for supposing that an economic return would follow from the careful investigation of the little-known semi-bathybial fauna of Indian waters, and from a comparison between it and the semi-bathybial faunæ of the Mediterranean Sea on the one hand and the Japanese Seas on the other.

WE have received from Messrs. Philip and Son a new orrery for finding roughly the positions of the sun, moon, and planets for any hour of the year, and their times of rising, southing, and setting. In general appearance it resembles their well-known planisphere, but, in addition, it is provided with two index arms graduated in degrees of declination—one for the sun, and the other for the moon or planet. The operations are simple, but the instructions given scarcely do justice to the arrangements for carrying them out. An almanac is, of course, a necessary accompaniment to the orrery. We can recommend it to young students of astronomy.

A BOTANICAL Club for California has been instituted under the presidency of Dr. H. W. Harkness.

WE learn from the *Botanical Gazette* that Prof. J. M. Coulter has been spending the summer in studying the Cactaceæ of the borders of the United States and Mexico, under the direction of the Department of Agriculture at Washington; and that an expedition has been organized to investigate the flora of Mount Orizaba, Mexico, under the superintendence of Mr. H. E. Seaton.

A QUARTERLY Review of Geological Science in Italy will shortly appear at Rome, edited by Sigg. M. Cermenati and A. Tellini.

MR. CHARLES TODD, in his Report on the Rainfall in South Australia and the Northern Territory during 1890, says that without doubt "the feature" of the year was the extraordinary rainfall (especially in the first three months) over the eastern and north-eastern portions of the continent, which continued throughout the whole year, more or less, in New South Wales, and, whilst giving that colony the wettest year on record, caused some stations to register over 100 inches.

THE Pilot Chart of the North Atlantic Ocean for September states that the most important storm of the month was the hurricane that devastated the island of Martinique on the evening of the 18th, causing the loss of 378 lives. The storm seems to have been of comparatively small diameter, and it probably originated south-east of the island, which it passed directly over, on a west-north-west track towards San Domingo. It recurved over the eastern Bahamas, and thence moved north-east close to Bermuda; where at noon of the 27th the wind blew with hurricane force from north-north-west. The weather, the same as in this country, was unsettled and rainy over the North Atlantic generally, especially off the Atlantic coast of the United States, and a considerable amount of fog has been reported. A submarine earthquake was experienced at 10h. 30m. a.m. on August 23, in latitude 36° 44′ N., longitude 59° 47′ W., by the s.s. *Robert Harrowing;* Captain Hughson reports that a strange commotion of the sea increased until the decks were filled with water. At 1h. p.m. the sea suddenly fell calm.

COLORADO apparently intends to be well represented at the great Chicago Exhibition. Besides the mineral, agricultural, and educational exhibits, the flora and fauna of the State will be shown in great completeness. Already more than 1000 specimens of plants have been pressed; nearly 200 varieties of fruit have been duplicated in wax, and more than 2000 species of insects have been mounted.

RETURNS have been collected in Prussia, showing the extent to which buildings belonging to the State, or entitled to State subsidy for rebuilding or repair, were damaged by lightning from the year 1877 to 1886. The number of buildings to which the returns relate is 53,502. Of these, 264 were struck during the period in question, or about five for every 1000 buildings in ten years; and in 81 cases a fire resulted. The following facts, given originally in the *Reichsanzeiger*, are reproduced in the current number of the *Board of Trade Journal*:—Of the 264 buildings struck, 107 had towers, and in six cases only the tower escaped being struck. Of the total number of buildings struck, fifteen were fitted with conductors, and of these latter only one building escaped injury. In two cases the conductor was injured, and on one occasion the lightning passed from the conductor to an iron water pipe. In five cases they were so constructed as to be either dangerous or useless; in six cases they were not struck at all, being inadequate for the size of the building, from which it will be seen that conductors are a safeguard against lightning only when carefully constructed and repaired, and fitted in numbers according to the size of the building which it is intended to protect. The amount of injury wrought by lightning on the 53,502 houses was, on the whole, inconsiderable, being only 1,136,683 marks (£56,834), or 4306 marks (£215) for each casualty, or 21 marks (a guinea) per building in ten years, that is 2·1 marks (about 2*s.*) per building per annum.

SOME parts of Australia seem to be admirably suited for the growth of the olive. Mr. Principal Thompson, of Dookie, says in a recent report that 700 olive trees planted in that district are robust and healthy, and that they produce splendid oil. He strongly recommends the planting of the olive around vineyards and homesteads for shade and shelter, and to give a picturesque appearance to the rural home. Apart from the making of oil, he believes it would pay handsomely to grow olive berries to feed pigs alone. Last winter the pigs at Dookie (about 80 head) were allowed to eat up the fallen berries in the olive grove; they had no other food for upwards of two months, and throve amazingly, their skins having a peculiar shining appearance, characteristic of animals being well fed.

Tobacco is being cultivated with much success in the German part of New Guinea, and is said to be better than the tobacco produced in Sumatra. It is expected that there will be a great increase in the amount grown during the coming year.

According to M. d'Amagher, the Russian correspondent of the *Monde Economique*, a central Agricultural Institute is to be established in Russia. It will include several sections—agricultural, geological, meteorological, botanical, chemical, and technological; and branches will be formed in the provinces.

Unusually fine atmospheric effects were produced by the clear weather of the Mediterranean during the month of July. According to the *Mediterranean Naturalist*, the new monthly periodical issued in Malta, the phenomenon of irregular diffraction was especially shown by the raising of the line of sight to such an extent that objects at great distances, at other times completely concealed from view, were apparently raised so much above their true position as to be clearly discernible from the shores of Malta and Gozo. The cliffs of the coast-line, and the undulatory contour of the mountains of Sicily, were to be seen distinctly with the naked eye on July 11 and 12, while the outlines of Etna stood boldly out against the clear azure sky. Although more than 100 miles away, the form of the mountain was perfectly recognizable.

The honey of the Malta bees has long been noted both for its purity and for its delicious flavour. A writer in the *Mediterranean Naturalist* says the flavour is largely due to the extensive crops of sulla (clover) that are annually raised throughout the islands, from which the bees derive the largest proportion of their material. It is estimated that to collect one pound of honey from clover, 62,000 heads of clover must be deprived of nectar, and 3,750,000 visits must be made by the bees.

Some excellent directions for the collection, preparation, and preservation of birds' eggs and nests have been put together by Mr. C. Bendire, and published by the United States National Museum. He begins his counsels by telling the would-be collector that unless he intends to make an especial study of oology, and has a higher aim than the mere desire to take and accumulate as large a number of specimens as possible regardless of their proper identification, he had better leave nests and eggs alone. The mere accumulation of specimens, Mr. Bendire points out, is the least important object of the true oologist. The principal aim of the collector should be to make careful observations on the habits, call-notes, song, the character of the food, mode and length of incubation, and the actions of the species generally from the beginning of the mating season to the time the young are able to leave the nest.

At one of the meetings of the Wellington Philosophical Society in 1885, Sir Walter Buller, F.R.S., exhibited a series of the so-called wandering albatross, and expressed his belief that there were two species under the common name of *Diomedea exulans*, one of them being highly variable in plumage, and the other distinguished by its larger size and by the constancy of its white head and neck. But, although that was his conviction, he did not feel justified in setting up the new species and giving it a distinctive name until he could produce incontestable evidence of its existence. From a paper read by him before the same Society in February last, and published in the new volume of the Transactions of the New Zealand Institute, we learn that he had lately had an opportunity of examining sixteen beautiful specimens of both sexes and of all ages, and that as the result of his study of these specimens he had no hesitation in speaking of a new species. "It is undoubtedly," he says, "the noblest member of this group, both as to size and beauty, and I have therefore named it *Diomedea regia*." He exhibited before the Wellington Society a series of both species, and in the course of some remarks on them stated that they keep quite apart from one another on their breeding-grounds, and do not commingle "except when sailing and soaring over the mighty deep, where a community of interest and a common pursuit bring many members of this great family together."

In the paper in which he deals with the species called by him *Diomedea regia*, Sir Walter Buller refers to a remarkable characteristic of the wandering albatross—a characteristic which has been carefully studied by Mr. Harris. At a certain time of the year, between February and June—Mr. Harris cannot exactly say when—the old birds leave their young and go to sea, and do not return until October, when they arrive in large numbers. During their absence the young birds never leave the breeding-ground. Immediately after the return of the old birds, each pair goes to its old nest, and, after a little fondling of the young one, turns it out, and prepares the nest for the next brood. The deserted young ones are in good condition, and very lively, frequently being seen off their nests exercising their wings; and, when the old birds come back, a young bird will often remain outside the nest and nibble at the head of the old one, until the feathers between the beak and the eye are removed, and the skin made quite sore. The young birds do not go far from land until the following year, when they accompany the old ones to sea. When the young are left in the nest at the close of the breeding-season, they are so immensely fat that Sir Walter Buller thinks they can subsist for months without food of any kind. Captain Fairchild has described to Sir Walter from personal observation the coming home of the wandering albatross, and the peremptory manner in which the young bird in possession is ordered to quit the nest, so as to make room for its successor.

The habits of the kingfisher (*Halcyon vagans*) formed the subject of an interesting paper read some time ago by Mr. J. W. Hall before the Auckland Institute, and now printed in the Institute's Proceedings. He raised the question, Is it customary for the kingfisher to capture live birds? Last winter he saw one with a live white-eye in its mouth. The tree the kingfisher was perched upon was not many yards distant from him, and he distinctly saw the little wings flutter convulsively as the kingfisher was preparing to beat its prey against the branch. So it could not have been a dead bird casually picked up. Perhaps this, he said, was an application of the *lex talionis*, for, besides being mercilessly persecuted by the small boys with their catapults, the kingfisher was not infrequently captured by the common hawk. But sometimes the hawk does not come off best. One day at Parawai (Thames) a hawk sailed round the bend of a hill, followed (accidentally, he supposed) by a kingfisher. There at once arose a great outcry, and the hawk came again in sight, bearing the kingfisher in its talons. But, nothing daunted, the kingfisher with its pickaxe of a bill pegged away at the breast and abdomen of its captor to such good effect that the hawk was glad to liberate its prey, whereupon the kingfisher flew away apparently but little the worse for the encounter, and carrying with it, he need hardly say, the full sympathy of the onlookers. A friend of the author had seen a kingfisher dive under water to escape the pursuit of a hawk.

Mr. J. Crawford, State Geologist and Mineralogist of Nicaragua, visited in 1888 the Amerrique Indians, from whose ancestral name "America" may have been derived; and he has lately submitted to the Boston Society of Natural History some interesting notes about them. They occupy a hilly region in the gold-mining part of the district of La Libertad, Nicaragua, where there are "true fissures," each containing gold in sufficient quantities to give profits to the mine and mill owners now "operating" them. A few melted masses of gold, weighing from half an ounce to two ounces each, pierced with holes, and in form supposed to have been made and used as ornaments before the Spanish occupation, have been discovered in the district; and Mr. Crawford regards it as a fair inference that the Amerrique Indians who dwelt in that part of Nicaragua at the time of its discovery by Columbus, September 1502, picked up and occasionally mined, melted, and used gold for sacred or ornamental purposes. The Amerrique Indians are usually well formed, 6 feet 6 inches to 6 feet 8 inches tall; and they are active, and appear to be strong and healthy. Nevertheless, they are dying out rapidly. Probably not more than 275 or 300 of them are now living. They live in dim pathless forests, and their occupation is to find in the woods various species of trees (*Siphonia*, *Castilloa*, &c.) They deeply scarify these, collect the exuding emulsion, and separate the contained elastic ("India") rubber; and this "India" rubber they carry on their backs more than 100 miles to sell to merchants in Rama or at the mouth of Rio Matagalpa. They have cleared some patches of ground, and plant corn by making holes in the soil with pointed sticks. They believe that with allied tribes they had in very ancient times a mighty prophet or cacique, who appeared suddenly, full grown, in their territory, and that to him many tribes of Indians gave allegiance. The impalpable form of this ancient chief has been seen by very old Indians proudly walking and gesticulating on the top of Mesa Totumbla. He is buried in, or returns by day to, a deep cavern in this Mesa (a mass of gneiss); and he indicates, by gestures, that he will one day collect the Indians into a great army, and lead them in person to many victories. Mr. Crawford found his way into the cavern, and discovered in it three crania of Indians with other bones of their bodies. These were sent in 1889 to the Paris Exhibition, and were afterwards transferred to the U.S. National Museum. A few crude beads or ornaments, evidently earlier than the Spanish occupation of Nicaragua, were also found.

The following are the arrangements for lectures during October at the Royal Victoria Hall:—October 6, Prof. T. Hudson Beare, the steam-engine, with experiments; October 13, Rev. Canon Browne, the invasion of England and Battle of Hastings, with illustrations from Bayeux tapestry; October 20, Mr. J. R. Green, flowers and their helpers; and October 27, Rev. E. Hill, the Channel Islands.

At a meeting held last year by the students of the Kindergarten department of the New York College for the Training of Teachers, various papers were read on the principles and methods of the Kindergarten. These papers have now been issued as one of the educational monographs of the New York College. Miss A. Brooks, who contributes an introduction, says the School Board of New York City is considering plans for the introduction of the Kindergarten system into its schools; and a movement begun by the New York Kindergarten Association is destined, she thinks, "to accomplish great things for the neglected children of the city."

"Egyptian Science," by N. E. Johnson, is the title of a work which will shortly be published by Messrs. Griffith, Farran, and Co.

The Durham College of Science, Newcastle-upon-Tyne, has issued its Calendar for the session of 1891–92. This College represents the faculties of science and engineering in the University of Durham, and thus constitutes an important portion of the University of the north of England. But it does not restrict its work to science and engineering; it fulfils all the functions of a University College.

The following works will shortly be published by Messrs. Crosby Lockwood and Son:—"The Mechanical Engineer's Pocket-book of Tables, Formulæ, Rules, and Data," a handy book of reference for daily use in engineering practice, by D. Kinnear Clark; "The Metallurgy of Argentiferous Lead," a practical treatise on the smelting of silver-lead ores, and the refining of lead bullion, including reports on various smelting establishments, and descriptions of modern furnaces and plants in Europe and America, by M. Eissler; "Engineering Chemistry," a practical treatise for the use of analytical chemists, engineers, iron masters, iron founders, students, and others, comprising methods of analysis and valuation of the principal materials used in engineering work, with numerous analyses, examples, and suggestions, by H. Joshua Phillips; "A Handbook of Brewing," a practical treatise for the use of brewers and their pupils, by Herbert Edwards Wright; "Condensed Machines," a selection of formulæ, rules, tables, and data, for the use of engineering students, science classes, &c., in accordance with the requirements of the Science and Art Department, by W. G. Crawford Hughes; "Milling," a treatise on machines, appliances, and processes employed in the shaping of metals by rotary cutters, including information on making and grinding the cutters, by Paul N. Hasluck, with upwards of 300 engravings; "Star Groups," a student's guide to the constellations, by J. Ellard Gore, with thirty maps; "Lessons in Commerce," by Prof. R. Gambaro, of the Royal High Commercial School of Genoa, edited and revised by James Gault, Professor of Commerce and Commercial Law in King's College, London.

Among the books announced by Messrs. George Philip and Son are the following:—"Delagoa Bay: its Natives and Natural History," by Rose Monteiro, with 20 original illustrations, after the author's sketches and from the natural objects, by A. B. and E. C. Woodward; "Paraguay: its History, Commerce, and Resources," by Dr. E. Bourgade, with 13 illustrations and a large coloured map; "Makers of Modern Thought," by D. Nasmith, Q.C.; "The Teacher's Hand-book of Slöjd," as practised and taught at Nääs, by Otto Salomon, Director of the Nääs Seminarium, with over 130 illustrations; "Hughes's Class-book of Modern Geography," an entirely new and completely revised edition, much enlarged by J. Francon Williams; "Geography of the British Colonies and Foreign Possessions," by the Rev. J. P. Faunthorpe, new and revised edition; "Systematic Atlas," for higher school and general use, a series of physical and political maps of all the countries of the world, with diagrams and illustrations of astronomical and physical geography, specially drawn by E. G. Ravenstein; "The Handy Volume Atlas of Astronomy," a series of 72 plates, with notes and index, by Sir Robert Stawell Ball, F.R.S.; "The Handy Volume Atlas of London," a series of 64 maps, with notes, compendium, directory, and complete index; "Atlas of Modern Geography," new and enlarged edition.

The additions to the Zoological Society's Gardens during the past week include two Macaque Monkeys (*Macacus cynomolgus*) from India, presented respectively by Mr. G. H. Sasse and Mrs. Gregorey; two Sykes's Monkeys (*Cercopithecus albigularis*) from East Africa, presented by Mr. F. Pardage; one Mozambique Monkey (*Cercopithecus rufo viridis*), one Garnett's Galago (*Galago garnetti*) from East Africa, one Blotched Genet (*Genetta tigrina*), one Ostrich (*Struthio camelus*) from East Central Africa, presented by Mr. Freith Anstruther; one Coypu (*Myopotamus coypus*) from South America, presented by Mr. Spencer H. Curtis; one Golden Eagle (*Aquila chrysaëtus*), European, presented by Mr. Herbert Bray; one —— Sand Grouse (*Pterocles* ——) from South Africa, presented by Mr. Max Michaelis; two Trocary Pigeons (*Columba trocary*) from Madeira, received from Dr. F. J. Hicks; one —— Elaps (*Elaps* ——) from Australia, presented by Mr. E. H. Meek;

one Rhomb-marked Snake (*Psammophis rhombeatus*), four Crossed Snakes (*Psammophis crucifer*), one Hygian Snake (*Elaps hygiæ*), two —— Snakes (*Dasypeltis scabra*) from South Africa, presented by Messrs. Herbert Melville and Claude Beddington; one Smooth Snake (*Coronella lævis*), two Common Snakes (*Tropidonotus natrix*) from Oxfordshire, presented by Mr. A. W. S. Fisher; one Otter (*Lutra vulgaris*) from South Wales, received in exchange; two White-tailed Sea Eagles (*Haliaëtus albicillay's*) from Norway, three Indian Python (*Python molurus*) from India, deposited; one Macaque Monkey (*Macacus cynomolgus*) from India, one Pardine Genet (*Genetta pardina*) from West Africa, purchased; one Vinaceous Turtle Dove (*Turtur vinaceus*), bred in the Menagerie.

OUR ASTRONOMICAL COLUMN.

LIGHTNING SPECTRA.—Mr. W. E. Wood, of Washington, has continued his observations of lightning spectra for the purpose of determining the origin of some of the lines previously recorded by him (NATURE, vol. xlii. p. 377). The result is that he is now able to say, in the *Sidereal Messenger* for August:—"Lightning spectra present but the characteristic lines of oxygen, hydrogen, nitrogen, and carbonic acid, and—what was puzzling to me—the line of the vapour of sodium. The absorption bands which I find in lightning spectra I think might be produced by the moisture in the air, a large quantity being present during thunderstorms." It is suggested that the sodium line owes its presence to the existence of meteoritic *débris* in the atmosphere.

A NEW ASTEROID.—The 315th asteroid was discovered by Charlois on September 1.

THE INTERNATIONAL GEOLOGICAL CONGRESS: WASHINGTON MEETING.

THE fifth meeting of the International Geological Congress, being the first ever held in America, was held at the Columbian University, Washington, from August 26 to September 1, with an attendance of sixty or seventy foreigners, from Austria-Hungary, Canada, Chili, France, Germany, Great Britain, Mexico, Peru, Roumania, Russia, Sweden, and Switzerland, and about two hundred members from the United States. The papers and discussions were generally in English, though French and German were to some extent spoken. French has been the language of all the previous Congresses.

Profs. James Hall and James D. Dana were elected Honorary Presidents, and J. S. Newbery Acting President. Owing to the absence of the latter, the chair was filled in turn by several of the Vice-Presidents.

FIRST DAY.—After the election of officers, as nominated by the bureau, Prof. Joseph Le Conte, as senior Vice-President, took the chair, and delivered the opening address, in which he said that the idea of an International Congress was born in America in 1876. Previous meetings have been held at Paris in 1878, Bologna in 1881, Berlin in 1885, and London in 1888. He briefly stated the purposes of this Congress, which were afterwards carried out—namely, to discuss classification of the Pleistocene rocks, of correlation, and of map notation. He compared the maps of Europe and America, showing the complexity of the former and the simplicity of the latter. He then considered some points in American geology:—(1) The general continuity of the record. (2) The prevalence of extensive faults, ranging from 100 to 2000 feet, and extending over great distances. (3) Peculiarities of mountain structure. Prof. Gilbert has discovered a new type of mountains formed by uptilted strata. The Sierra Nevada is an illustration. (4) Extensive lava floods, covering areas from 10,000 to 100,000 square miles in extent, and from 2000 to 4000 feet deep. No such floods are found elsewhere. Those of India are the nearest approximation; but in Europe the lava beds are small and much cut up. (5) The great continental movement, commencing in the later Tertiary, and terminating in the beginning of the Quaternary, which has caused changes of level amounting to 2500 or 3000 feet on both sides of the continent. (6) The ice-sheet of the glacial epoch was first and most completely demonstrated in America.

Other addresses were delivered by Mr. Hubbard, Chairman of the Local Committee; Mr. Noble, Secretary of the Interior, who has official control and supervision of the Geological Survey of the United States; Prof. Hughes of England, Prof. Gaudry of France, and Major Powell, Chief of the Geological Survey.

SECOND DAY.—The entire day was occupied by a discussion on classification of the glacial Pleistocene deposits. Prof. T. C. Chamberlin opened the discussion by stating that classification might be made on three grounds: (1) structural; (2) chronological; (3) genetic. The first was very easy, being an obvious division into assorted and unassorted drift. The second was extremely difficult, and could not be accurately made till after a full determination of the third. He accordingly proposed the following general classes: (1) formations produced by the direct action of Pleistocene glaciers; (2) formations produced by the combined action of Pleistocene glaciers and accompanying glacial drainage; (3) formations produced by glacial waters after their issuance from Pleistocene glaciers; (4) formations produced by floating ice derived from Pleistocene glaciers; (5) formations produced by shore ice and ice floes due to low Pleistocene temperature, but independent of glacier action; (6) formations produced by winds acting on Pleistocene glacial and glacio-fluvial deposits under the peculiar conditions of glaciation.

This paper was discussed very thoroughly. Prof. T. McK. Hughes pointed out that the classification suggested by Prof. Chamberlin was purely genetic. He then explained the abundance of striated boulders in one part of the glacial deposits and their absence in another. If the supply of material (that is, of rock bosses above the ice) ceases at any point, then all the boulders will gradually sink through the ice and become glaciated at the bottom. Prof. Hughes also thought that two distinct types of ridges formed of glacial material were confused under the names—kames, osars, and eskar. He also explained the "pitted plains" as due to an unusual interruption between the hills or ridges of eskar character. He expressed his opinion that the glacial period was a continuous one, in England at least, except for slight changes due to unimportant oscillations.

Mr. McGee mentioned the importance of land forms in interpreting geological processes. Any primary geological classification must be genetic. He discussed in detail the following scheme of classification of Pleistocene deposits:—

Classification of Pleistocene Formations and Land Forms.

- A. Aqueous:
  - 1. Below base level.
    - *a.* Marine.
    - *b.* Estuarine.
    - *c.* Lacustral.
  - 2. At base level.
    - *a.* Littoral.
    - *b.* Marsh.
    - *c.* Alluvial (certain terraces, &c.).
  - 3. Above base level.
    - *a.* Torrential.
    - *b.* Talus (including playas).
- B. Glacial:
  - 1. Direct (Chamberlin's Class I.).
  - 2. Indirect (Chamberlin's Classes II. to V., in part).
- C. Aqueo-Glacial (Chamberlin's Classes II. to V., in part).
- D. Eolic (Chamberlin's Class (?) VI.).
- E. Volcanic:
  - 1. Direct.
    - *a.* Lava sheets.
    - *b.* Cinder cones.
    - *c.* Tuffs, lapilli sheets, &c.
  - 2. Indirect.
    - *a.* Ash beds.
    - *b.* Lapilli sheets.

Prof. Chamberlin, in closing the discussion, said that there was great difficulty in applying a chronological classification, and that such a classification might even act as a barrier to observation and to the recognition of the truth. Chronological classification is the ultimate goal of glacial studies, but it is something for which we are not as yet prepared. Red, oxidized sub-soils are not developed in northern latitudes. Organic deposits between glacial layers are abundant in the West, but do not belong to a single horizon. Many facts of erosion and